REMARKS

General:

Claims 19, 21-26, 28-31 and 34-42 were pending in the application before this amendment.

Claims 19, 22, 23, and 35 are amended as discussed below.

No new matter has been added by this amendment.

Procedural posture:

The office action summary shows the present action as non-final. PAIR shows the status of the application as "Non Final Action Mailed." Since this is a first action after an RCE that presented substantial new grounds of patentability, a non-final action is clearly proper. Paragraph 10 on pages 5 and 6 of the office action, purporting to make the present office action final, is clearly erroneous, and has been ignored. (It is believed that parts of the present office action, including paragraph 10, were mistakenly copied from the previous office action.)

Specification:

The specification was objected to as being "replete with incomprehensible expressions" although only one example was identified in the office action, and that was not in fact incomprehensible, since the examiner was able to comprehend it and propose better wording. The specification has been reviewed throughout. Nothing incomprehensible was found. However, the language has been amended to improve both the fluency of the English and the faithfulness to the authentic PCT text. Certain unexplained handwritten annotations on one of the copies of the specification in the Image File Wrapper have been taken into consideration in preparing the amendments.

35 U.S.C. § 112:

Claims 19 and 35 were rejected under the written description requirement on the ground that the limitation to an angle greater than 0° and less than 180° was not supported by the description. The examiner contends that the original description discloses only an angle between a minimum greater than 0° and a maximum less than 180°. The maximum and minimum are set by the physical size of the coils, but no minimum size is set for the coils (except for practical reasons there is a reasonable inference that the angle cannot be exactly 0). In order to emphasize that the angle cannot be exactly 0° or exactly 180°, the examiner's proposed wording has been adopted in claims 19 and 35. Textual support for the new language is found at page 8, lines 16-18, of the English text filed under § 371.

Claims 19, 22, and 23 were rejected on the ground that the expression "time varying currents" has no proper support in the specification as originally presented. Claim 19 has been amended to recite that the current is "a function of time," an expression that is used repeatedly in the English text filed under § 371, see for example page 9, lines 22 and 30. Claims 22 and 23 have been amended to remove the term "time-varying."

Claims 19, 22, 23, and 35 are believed now to be clear, and properly supported by the original disclosure.

It is assumed that claims 24-26 and 28-31 were rejected merely because of their dependency from claim 19, and the rejection of those claims is deemed to have been overcome by the amendments to claim 19. The rejection of claim 21 is believed to be erroneous, because claim 21 was rewritten in independent form on 5 December 2005, and does not recite either the features against which a rejection has been stated.

35 U.S.C. § 102:

Claims 19, 21-26, 28-31, and 34-42 were rejected as anticipated by U.S. Patent No. 3,551,794 (Vander Heyden). The rejection is traversed. The rejection appears to rely on the examiner's statement that Vander "Heyden further teaches a sinusoidal electrical current (time-varying current) is applied to the coils" 12, 18, 20, 26 or 22, 24. In fact, coils 12 and 18 are clearly shown in Fig. 1 of Vander Heyden as being supplied only with a DC current.

22, 24 are clearly shown in both Fig. 1 and Fig. 6 as being detector coils to which no current is applied.

Vander Heyden does not show or suggest any configuration in which two coils or pairs of coils, both of which are supplied with a current varying as a function of time, are arranged at an angle to one another in a common magnetic field plane, as required by claims 19, 21, and 34 and claims dependent therefrom.

Vander Heyden does not show or suggest any configuration in which two coils or pairs of coils are arranged obliquely to one another in a common magnetic field plane, as required by claim 38 and claims dependent therefrom.

For all of the above reasons, the present invention, as claimed in claims 19, 21-26, 28-31 and 34-42, is believed to be both new and non-obvious over Vander Heyden.

Additional considerations:

A copy of the doctoral thesis of Philippe Vallée of the Université Pierre et Marie Curie in Paris, France, is filed with this response. The thesis is not prior art against the present application, because it was not written until the year 2004, but is provided to corroborate the validity of the present inventor's techniques and the underlying theories. An English abstract is provided on page 153 (at the end, after the bibliography and annex).

Ph. Vallée's thesis shows that the Lorentz force acts against the ionic layers which stabilize the nanobubbles of CO_2 gas in water. Vallée shows that low frequency magnetic and electric fields act on the gas/water interface by destroying the double ionic layer, which stabilizes the nanobubbles of gas. The ionic layer helps to oversaturate the water with calcium carbonate, but if the layers are destroyed, the nanobubbles of CO_2 gas are destroyed, the gas is dissolved in the water so that the equilibrium is modified and the calcium carbonate precipitates out. A colloid of calcium carbonate will also develop with the adsorption of the free ions.

On page 47, lines 12-16, the experimental configuration is described:

"The electromagnetic fields are generated by a solenoid coil (with a diameter of 50mm, height of 80mm, copper wire, 4367turns/m, L=3mH inductance and 3Ω resistance, in which

an alternating current modulated from $3.8x10^{-3}$ to 480mA is passed, creating a magnetic field at the center of the coil between 18μT and about 2.3mT and an electric field between 0.06 and 7.9 mV/m.)"

The thesis confirms that a magnetic or electric field may destabilize the double ionic layer, as it will be found on page 100, lines 7-13:

"In fact, bubbles in water present analogous behavior to a colloidal solution. Indeed, colloidal solution, like bubbles, are particles onto which ions are adsorbed. Around the adsorbed ions, a shell of counter ions (corresponding to a diffuse layer) are equally present. As described and discussed above, the adsorption of ions by gas bubbles and the formation of a shell of counter-ions take part in the stabilization of the bubbles. The electromagnetic field can have a large action on the ions."

Page 17, lines 25-29:

"The important factors, referenced by Bush, which are increasing the effect of magnetohydrodynamism are the conductivity of the solution (existence of an optimal threshold to produce a current), the linear and continuous velocity of the fluid which has to be fast enough (here 1.5m/s), and the magnetic flux density perpendicular to the circulation of the fluid."

Page 18, lines 21-28:

"Gabrieli has observed the action of 0.16T permanent magnets on a salt solution with one component being calcium carbonate, as a function of the treatment period, the position of the magnets (reversed pole or not), the velocity of the solution and the chemical nature of the pipe at the treatment area. After a minute of circulation (5 rounds of 12s), he has observed a 30% reduction of free calcium concentration. This reduction would be due to the degassing of calcium carbonate by increasing the pH of the solution which would lead to the precipitation of the calcium carbonate. If seems that the optimum velocity of the flux would be 3.5m/s."

Page 19, lines 18-24:

"Gamayunov has computed that when the water velocity is 2m/s across a 0,1T static magnetic field, the generated Lorentz force is sufficient to create a distortion of the electrical double layer of ions surrounding colloidal particles. This force perpendicular to the magnetic field direction and the flux would guide the ions of reversed charge in opposite direction. This would induce an ionic exchange between the stable Stern inside layer and the outside diffused layer creating a metastable state, with a relaxation time going up to several days."

Ph. Vallée underlines the action of a magnetic field on moving water. He notices that the action depends especially on the speed of the water. However, in the Riera device, the magnetic field is moving with respect to the water.

Vander Heyden does not intend to create stereochemical deformations. His intention is only to cause precession. The magnetic field in Vander Heyden's device may act on the water, but because of the motion of the water, and not because of the motion of the magnetic field. Vander Heyden's magnetic field is a fixed one, generated with a permanent magnet or a DC inductor and an AC inductor. The result is a magnetic field varying around a fixed value. The mean value of the speed of the magnetic field through the water is zero so that the action is the same as that of a fixed magnetic field.

In the Riera device the mean value over time of the magnetic field is zero but the mean value of the relative speed is fixed but not zero. This mean value of the speed increases with the rotation speed. In short, the Riera's invention aims to increase the Lorentz force by increasing the relative speed of the magnetic field. That is not possible with Vander Heyden.

Conclusion:

In view of the foregoing, reconsideration of the examiner's rejections and allowance of claim claims 19, 21-26, 28-31, and 34-42 is earnestly solicited.

Respectfully submitted

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